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ABSTRACT

In the last twenty years a growing body of empirical research has re-established mental imagery as an important part of current cognitive theory. This paper describes research attempting to determine the relationship between mental imagery, reading comprehension, and reading attitude. One hundred twenty-four Wisconsin eleventh and twelfth grade students were evaluated by a standardized reading comprehension survey, a reading attitude survey, and a questionnaire on mental imagery. Subjects' mental imagery appeared to be unrelated to reading comprehension, although a slight positive correlation between imagery scores and reading attitude scores was revealed. A positive correlation between subjects' comprehension scores and their reading attitude scores was evident, and a combined score of imagery and comprehension was significantly related to reading attitude. Further investigation of the effect of imagery on reading comprehension and attitude, measurement of imagery during reading, classification of imagery types among readers, and the possibility of developing strategies to increase imagery use during reading are encouraged. (RS)

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Pictures in Your Head:

A Discussion of Relationships Among

Mental Imagery, Reading Comprehension, and Reading Attitude

A paper presented at the twenty-first annual convention of the International Reading Association, Anaheim, California, May 13, 1976.

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Pictures in Your Head

A Discussion of Relationships Among Mental Imagery, Reading Comprehension, and Reading Attitude

When you read, do you see "pictures" in your head?

Behind this question lie more than 2500 years of speculation and controversy about the phenomenon, mental imagery. It is a common, persistent, and troublesome concept. Mental imagery is a troublesome concept because it has never been explainable. What, for instance, is its role in the thinking process? Where and how are images stored in the brain? More importantly, how are they retrieved? What stimulates apparently unbidden images of nightmares and daydreams? Mental imagery is a persistent concept that has survived for thousands of years. It is a common concept in that nearly everyone freely admits to having experienced mental images.

For example, try yourself on each of the following imaging activities:

1. Picture in your mind's eye the room you slept in as a child or teenager. What specific details emerge? Notice colors, dimensions, sounds, odors, and feelings. What is most vivid about your image?
2. Think of a relative or a close friend whom you have not seen recently. Can you recall the facial features and habitual body posture of that person?
3. Picture the furniture in the living room of your home. Notice the exact arrangement of the various objects. Now, in your mind's eye, rearrange the furniture. What exactly did you do? What sensory images were aroused?
4. Try to visualize a boy dressed in blue jeans and tee shirt riding a red bicycle. Which direction is he riding? How fast is he traveling? About how old is the boy? Were his facial features

clear and distinct, or were they hazy and vague?

5. Now try Galton's famous imagery problem. Imagine your breakfast table this morning. How clear and sharp is your image? What details do you notice? How bright is the image? What colors do you see most vividly?

It is probable, although not absolutely certain, that you were able to image all of these situations. You may wish to share these imaging experiences with others. If you try these with a number of people, you will be likely to find, as did Galton and others, that most people report that they do image and that there is considerable variety in their reports.

Most persons ascribe to having experienced mental imagery, especially when very young. Adults do not report imaging as readily as do children. The process of maturation, apparently, is accompanied not only by the loss of childhood's innocence but also by a withering of the ability to form vivid mental images. Whether this decrease in imaging ability is a physiological or a cultural phenomenon is another troublesome aspect of the mental imagery concept. And it is this very same decrease in imaging ability that leads to the controversy surrounding the concept. What role, if any, does mental imagery play in the thinking process? Through the centuries, there have been many attempts to answer the question.

About 500 B.C., the Greek poet Simonides wrote, "Words are the images of things." Aristotle held the position that thought is composed of images. In the 1600's, John Locke, the English philosopher, continued the hypothesis that thinking is accomplished with mental images. Around the turn of the Twentieth Century, mental imagery remained as a basic concept in the psychology of thought, with such men as William James, Francis Galton, and Edward

Titchener speculating, investigating, and writing about it.

However, in the early 1900's, the concept of mental imagery as an important component of the thought process began to be questioned and, eventually, belittled. The Behaviorist movement in psychology, led by J. B. Watson and others, concerned itself with the strictly empirical methodology of the so-called "pure" sciences. The Behaviorists insisted upon the necessity for quantifiable measurements and replication of experimental data. Mental imagery, they held, was mere "mentalistic baggage," extremely subjective in nature, and certainly not quantifiable. Thus, investigations involving mental imagery were brought to a near standstill for nearly half a century as the Behaviorists worked out the major aspects of stimulus-response theory. If images were considered at all by the Behaviorists, they were regarded as a mere childhood stage through which one must pass in order to become a logical, mature-thinking adult. There was a great deal of concern about inner-speech versus mental imagery as primary mediator of thought. The controversy was decided in favor of the primacy of words.

However, mental imagery is a persistent notion. In the 1950's, research into the phenomenon of mental imagery began to show a renewed vitality. New technology allowed new research methods, unavailable to the early Behaviorists. In the last twenty years a growing body of empirical research has re-established mental imagery as an important part of current cognitive theory. Some noteworthy studies, pertinent to the present discussion, are those of Werner (1957), Bruner (1964), Vernon (1967), Beritashvili (1969), Tversky (1969), Paivio (1969), Anderson and Kulhavy (1972), Koser and Natkin (1972), Litt (1973), and Bull and Wittrock (1973).

These and other studies reaffirmed the utility of images for learning and memory processes. Indeed, a number of philosophers and researchers such as Arnheim (1969) and Vernon (1967) believe that thought itself is non-verbal. They hold that perceptions are stored in the mind in the form of images which can be retrieved upon command. Other investigators concede that imaging may function as part of the mediational process, but they remain firm in their insistence upon the primacy of words in the cognitive process.

Of special note is Paivio's dual coding model of comprehension. Based upon the evidence gathered from many empirical studies, Paivio (1969) has theorized that imagery and verbal processes are independent but interconnected systems. Paivio assumes that imagery is specialized for symbolic representation of concrete situations and events, that it permits speed and flexibility of transformational thinking, and that it is specialized for parallel processing in the visual-spatial sense. The verbal processing system, Paivio asserts, is specialized for dealing with sequential, logical information processing and for dealing with abstract problems, concepts, and relationships. Paivio has demonstrated in a wide variety of carefully constructed studies that his dual coding model of comprehension can be empirically supported. In brief, the dual coding model holds that words can be used as stimuli for arousing associations with either images, or other words, or both. Similarly, images can act as stimuli for arousing associations with other images, or with words, or both. Thus, according to Paivio's model, both images and words can act as mediators in comprehension and language behavior.

A striking similarity can be noted between Paivio's dual coding theory and the split-brain hypothesis advanced by Sperry (1951, 1975). "...both the left and right hemispheres of the brain have been found to have their own

specialized forms of intellect. The left is highly verbal and mathematical, performing with analytic, symbolic, computerlike, sequential logic. The right by contrast is spatial and mute, performing with a synthetic spatio-perceptual and mechanical kind of information processing that cannot yet be simulated by computers." (Sperry, 1975)

The two hemispheres of the brain are connected by a thick bundle of nerve fibers known as the corpus callosum. If the corpus callosum is severed, the two cerebral hemispheres act independently, processing information each in its unique way. Thus it would appear that Sperry's research into the physiological aspects of the brain provides added credibility to Paivio's hypothesis of a dual coding process in learning and comprehension.

What, then, are the implications of mental imagery research and split-brain research for reading instruction? Before this can be answered, it is necessary to state a number of my underlying assumptions:

1. Thinking is a cognitive process which involves the use of mental images.
2. Reading is a thinking process.
3. Reading, therefore, involves mental images.
4. People tend to persist in activities which satisfy their needs.
5. People have a need for cognitive stimulation and/or vicarious experiences.
6. Reading can fulfill the human need for cognitive stimulation and/or vicarious experiences.
7. People who read to fulfill their need for cognitive stimulation and/or vicarious experiences will persist as readers.

Two educational psychologists, Mowrer (1960) and Bugelski (1969), have theorized that reading and thinking somehow share the same neural processes involved in both mental imagery and emotion.

Much research has been done to investigate the development of reading comprehension. Similarly, a large body of literature exists which deals with the development of positive attitudes toward reading. A few studies have investigated the relationship of mental imagery to reading comprehension (Anderson and Kulhavy, 1972). Until now, however, there has been little or no inquiry into the relationship of mental imagery to reading attitude.

In a study completed in August of 1975, an attempt was made to determine if there were any observable relationships among the three variables: mental imagery, reading comprehension, and reading attitude. Subjects of the study were 124 eleventh and twelfth grade students at two high schools in Wisconsin. Three classroom groups of students were chosen at random from all of the eleventh and twelfth grade English classes at each school. Subjects were given three instruments to complete: a standardized reading comprehension test, a reading attitude survey, and a questionnaire upon mental imagery. When subjects' scores on the three instruments were analyzed statistically, the results suggested several conclusions.

First, there was no significant relationship between mental imagery and reading comprehension. That is, on this imagery questionnaire, which was not connected with prose reading, subjects' scores appeared to be independent of their reading comprehension scores. This result suggests that a person may report vivid mental images and still obtain a low score on a test of reading comprehension, and vice versa.

Second, there was a weak, but significant positive correlation between subjects' imagery scores and their reading attitude scores. This finding would seem to support the hypothesis advanced by Mowrer and by Bugelski that mental imagery is somehow related to emotions.

Third, there was a positive correlation between subjects' comprehension scores and their reading attitude scores.

A fourth result, obtained by combining subjects' imagery and comprehension scores, indicated that this combined score was significantly related to subjects' scores on reading attitude.

Tables 1 through 5 illustrate the results.

(Insert Tables 1 through 5 about here.)

From this first study, it seems apparent that certain relationships do exist among the three variables, and that these relationships are strong enough to warrant further investigation.. (Cramer, 1975)

Further research is underway at the present time, but much more is needed before we can hope to unlock the precise relationships among mental imagery, reading comprehension, and reading attitude.

It is my opinion that this needed research falls into four general areas: 1) defining imagery in its role in reading comprehension and reading attitude; 2) classifying imagery types among readers; 3) measuring imagery during reading; and 4) devising, implementing, and assessing strategies for increasing students' ability to use imagery during reading.

Within these four areas, the following questions are illustrative of the research that is needed:

1. What exactly is mental imagery? How may it best be defined?
2. To what extent do individual differences in imaging ability affect students' ability to read?

3. What is the proper use of illustrations in teaching a child to read?
4. Can more reliable methods and instruments for testing imagery ability be devised?
5. What, if any, are the effects of age, sex, IQ, and personality type on students' imaging ability?
6. What is the role of mental imagery in the acquisition of concepts?
7. What materials and teaching methods may be employed to increase a student's ability to image?
8. Under what conditions, if any, might vivid mental imagery interfere with reading comprehension?
9. Can words be classified as to their probable image-evoking value?
10. What may be the effects of cross-cultural differences in imaging ability?
11. Among sensory modalities, which images are most closely related to reading comprehension? To reading attitude?
12. To what extent is cerebral hemispheric dominance a factor in imaging ability?
13. When you read, do you see pictures in your head?
14. When you read, should you see pictures in your head?

TABLE 1

MATRIX OF CORRELATION COEFFICIENTS FOR SCORES ON IMAGERY, COMPREHENSION, AND ATTITUDE

Variable	Imagery	Comprehension	Attitude
Imagery	1.000		
Comprehension	.124	1.000	
Attitude	.188*	.419**	1.000

*significant at $p < .036$
**significant at $p < .0001$

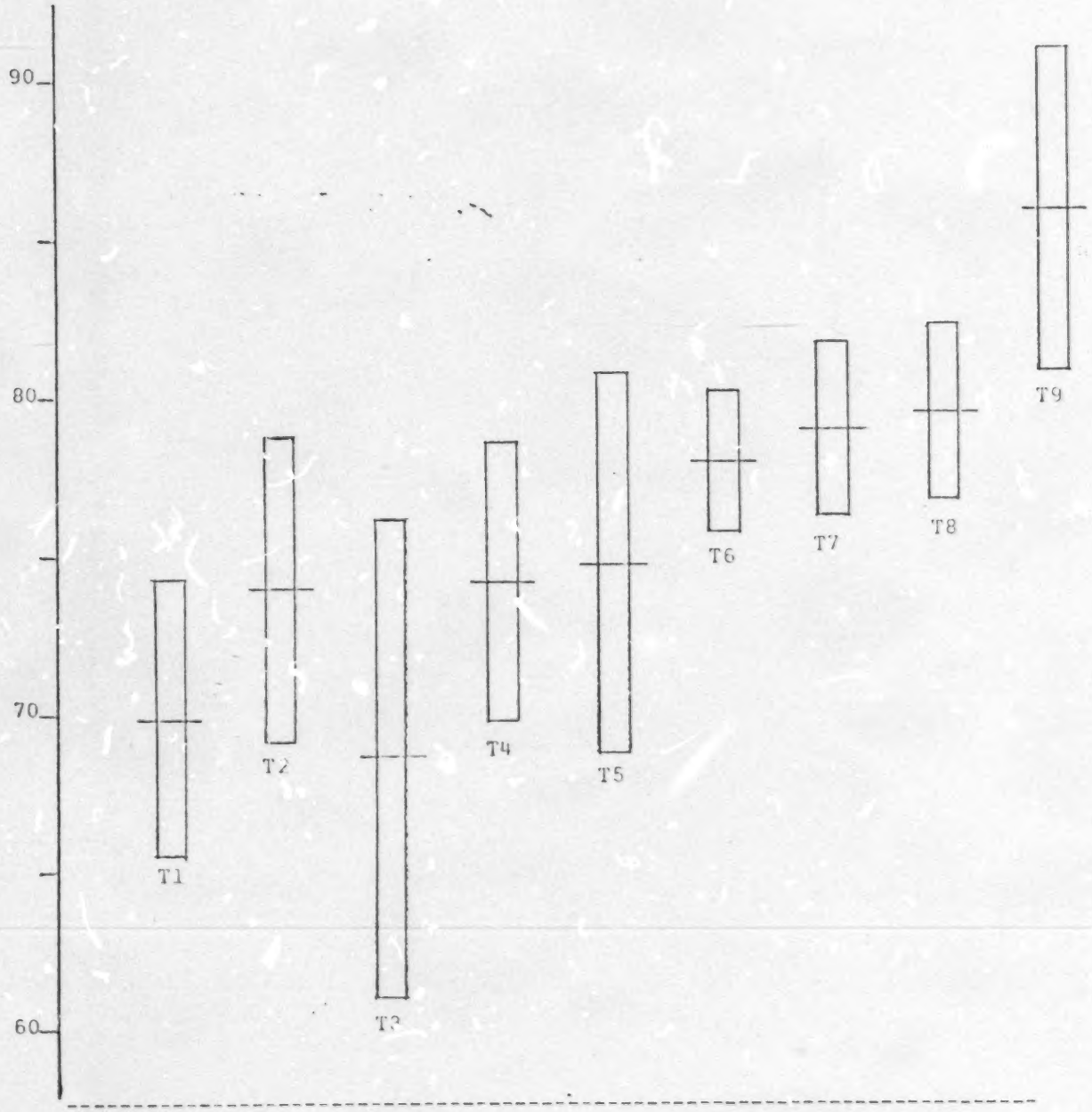
TABLE 2

ATTITUDE MEAN SCORES IN CROSS TABULATION CELLS: COMPREHENSION X IMAGERY

Imagery	Comprehension High	Middle	Low
High	85.9	78.0	68.6
Middle	79.5	74.7	74.0
Low	79.0	74.2	69.9

FIGURE 1

ATTITUDE MEANS WITH 90% CONFIDENCE BANDS FOR COMPREHENSION X IMAGERY CELLS



KEY:
C = Comprehension
I = Imagery
H = High
M = Middle
L = Low

	CxI		CxI		CxI
T1:	L L	T4:	M L	T7:	H L
T2:	L M	T5:	M M	T8:	H M
T3:	L H	T6:	M H	T9:	H H

FIGURE 2

REGRESSIONS OF ATTITUDE SCORES ON COMPREHENSION SCORES FOR HIGH, HIGH-MIDDLE, LOW-MIDDLE, AND LOW IMAGERY QUARTILES

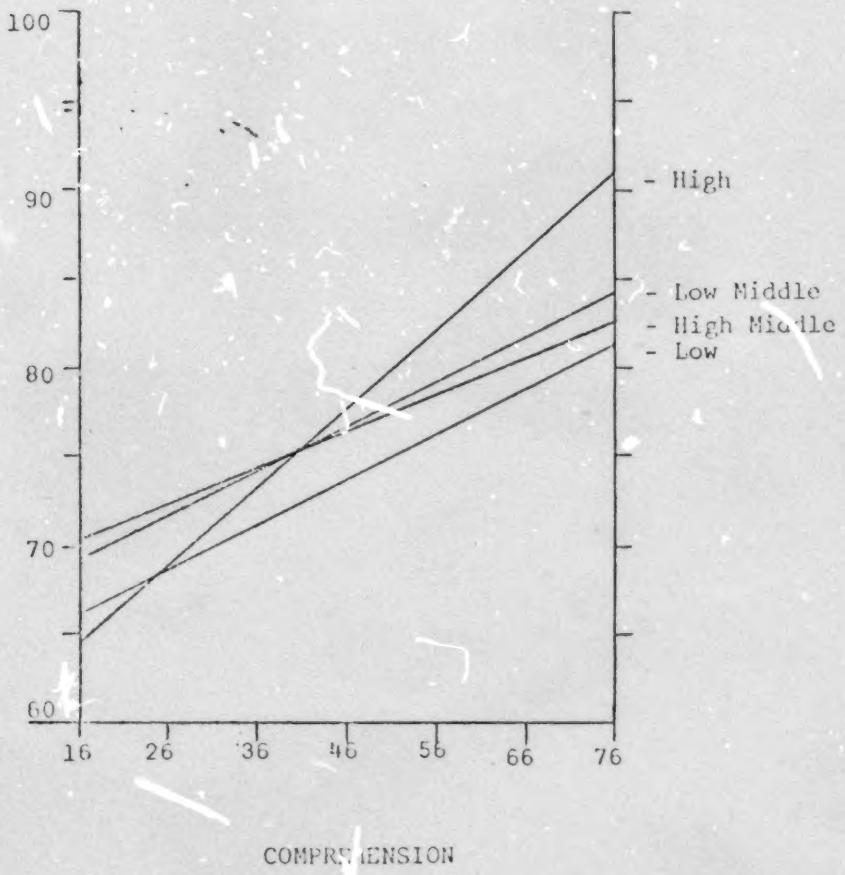
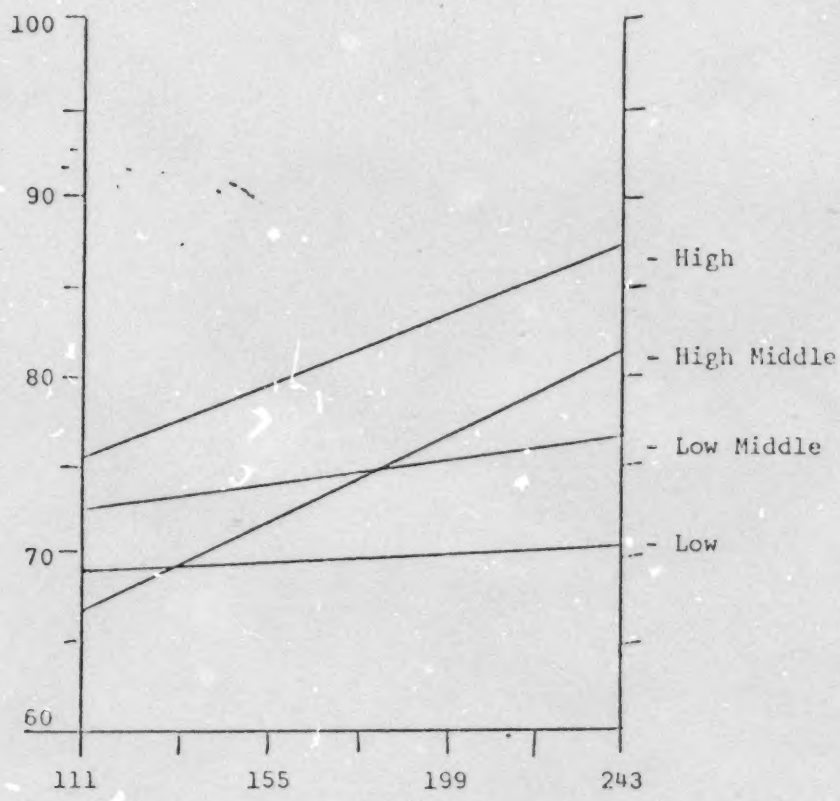


FIGURE 3

REGRESSIONS OF ATTITUDE SCORES ON IMAGERY SCORES FOR HIGH, HIGH-MIDDLE, LOW-MIDDLE, AND LOW COMPREHENSION QUARTILES



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